

REMARKS

In the last Office Action, the Examiner objected to claims 1 and 3 as containing informalities. Claims 2 and 14 were rejected under 35 U.S.C. §112, second paragraph, for indefiniteness. Claims 1-3, 13 and 15-20 were rejected under 35 U.S.C. §102(b) as being anticipated by U.S. Patent No. 6,650,804 to Mills et al. ("Mills"). Claims 4-6 were rejected under 35 U.S.C. §103(a) as being unpatentable over Mills in view of U.S. Patent No. 6,542,656 to Hill. Claim 14 was rejected under 35 U.S.C. §103(a) as being unpatentable over Mills in view of U.S. Patent No. 6,259,835 to Jing. Claims 7-12 were objected to as being dependent upon a rejected base claim, but indicated to be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Applicants and applicants' counsel note with appreciation the indication of allowable subject matter concerning claims 7-12. However, for the reasons noted below, applicants submit that amended claims 1-3, 7, 8, 17 and previously presented claims 4-6, 9-16 and 18-20 also patentably distinguish from the prior art of record.

In accordance with the present response, independent claims 1 and 17 have been amended to better define the "straight line" in response to the Examiner's concerns in

the last line of paragraph 29 of the December 7, 2004 Office Action. More specifically, claims 1 and 17 have been amended to define the bounds of the "straight line" by reciting that the straight line along which the tip portions of the optical fibers are disposed extends in a direction generally perpendicular to the optical axis of each of the optical fibers. Page 20 of the specification has been revised only to provide literal basis for the amendment to claims 1 and 17 in compliance with 37 C.F.R. §1.75(d)(1). Support for the foregoing amendment to the specification and claims 1, 17 can be found in the embodiments of the optical switches shown in Figs. 2A and 8-10 as originally filed. Accordingly, no new matter has been added.

Claims 1, 3 and 2, 14 have also been amended to overcome the objections and indefiniteness rejection, respectively, raised by the Examiner. Allowable claims 7 and 8 have been rewritten in independent form including all of the limitations of the corresponding base and intervening claims. The previously submitted abstract has been amended only to more clearly reflect the invention to which the amended claims are directed and to comply with the length requirement specified in 37 C.F.R. §1.72.

In view of the foregoing, applicants submit that the objection to the claims and the rejection under 35 U.S.C. §112, second paragraph, have been overcome and should be withdrawn.

The amendments to the specification and claims made herein do not raise new issues requiring further search and/or consideration. Instead, independent claims 1 and 17 have been amended to better define the "straight line" in response to the Examiner's concerns in the last line of paragraph 29 of the December 7, 2004 Office Action, page 20 of the specification has been revised only to provide literal basis for the amendment to claims 1 and 17 in compliance with 37 C.F.R. §1.75(d)(1), claims 1, 3 and 2, 14 have been amended to overcome the objections and indefiniteness rejection, respectively, raised by the Examiner, allowable claims 7 and 8 have been rewritten in independent form as proposed by the Examiner, and the previously submitted abstract has been amended only to more clearly reflect the invention to which the amended claims are directed and to comply with the length requirement specified in 37 C.F.R. §1.72, thereby placing the application in condition for allowance or otherwise materially reducing the issues which remain for appeal.

Applicants request reconsideration of their application in light of the following discussion.

Brief Summary of Invention

The present invention is directed to an optical switch and to an optical switch device equipped with a plurality of optical switches.

As described in the specification (pages 1-9), conventional optical switch devices are associated with long optical paths along which beams emitted from optical fibers are guided during switching operations. Furthermore, mirrors for guiding the beams along the optical paths are arranged so as to occupy a large area which increases the overall size of the conventional optical switches.

The present invention overcomes the drawbacks of the conventional art. Fig. 10 shows an embodiment of an optical switch according to the present invention embodied in the claims. The optical switch has at least a first optical fiber 2, a second optical fiber 3, and a third optical fiber 5 disposed generally parallel to each other and spaced at non-equal intervals in a direction generally perpendicular to an optical axis of each of the optical fibers. The optical fibers have tip portions disposed approximately along a straight line extending in a direction generally perpendicular to the optical axis of each of the optical fibers. The optical switch has first guiding means (e.g., mirrors 18a-18c) and second guiding means (e.g., mirrors 19a-19d). The first

guiding means is non-movably mounted in front of the tip portions of the optical fibers 2, 3, 5 for guiding a beam emitted from the first optical fiber 2 to the second optical fiber 3 along a first optical path disposed between the tip portion of the first optical fiber 2 and the tip portion of the second optical fiber 3. The second guiding means is mounted for undergoing movement to a position in front of the tip portions of the optical fibers 2, 3, 5 for guiding the beam emitted from the first optical fiber 2 to the third optical fiber 5 along a second optical path disposed between the tip portion of the first optical fiber 2 and the tip portion of the third optical fiber 5. The second optical path has a length (i.e., $2F+A+B+C$) substantially equal to a length (i.e., $2F+2E+2D+A$, where $B+C=2E+2D$) of the first optical path.

By the foregoing construction, the length of the optical paths along which a beam from one optical fiber is guided to another optical fiber of the optical switch is shorter as compared to the conventional art. Furthermore, by providing the non-movable first guiding means and the movable second guiding means, the overall size of the optical switch is reduced as compared to conventional optical switches.

Traversal of Prior Art Rejections

Rejection Under 35 U.S.C. §102(e)

Claims 1-3, 13 and 15-20 were rejected under 35 U.S.C. §102(e) as being anticipated by Mills. Applicants respectfully traverse this rejection and submit that amended claims 1-3, 13 and 15-20 recite subject matter which is not identically disclosed or described in Mills.

Each of amended independent claims 1 and 17 is directed to an optical switch. Claim 1 requires at least first, second, and third optical fibers disposed generally parallel to each other and spaced at non-equal intervals in a direction generally perpendicular to an optical axis of each of the optical fibers, the optical fibers having tip portions disposed approximately along a straight line extending in a direction generally perpendicular to the optical axis of each of the optical fibers. Claim 17 requires at least first, second and third optical fibers mounted on the main body and disposed generally parallel to each other with tip portions of the optical fibers disposed approximately along a straight line extending in a direction generally perpendicular to an optical axis of each of the optical fibers. No corresponding structural combinations are disclosed or described by Mills.

Mills discloses in Fig. 3 an optical switch 10b having pairs of input and output ports 38-1 to 38-4 (optical

fibers) and fixed and switchable deflectors 40a-40e (guiding means). The optical fibers 38-1 to 38-4 are staggered to create equal length light paths. A similar optical switch 10c having staggered optical fibers 48-1 to 48-4 is disclosed in Fig. 4 of Mills.

As recognized by the Examiner, the tip portions of the optical fibers disclosed by Mills appear to be disposed along a straight line which in the embodiments of Figs. 3 and 4 would be represented by a diagonal straight line. This diagonal straight line clearly does not extend in a direction generally perpendicular to the optical axis of each of the optical fibers. In contrast, each of amended independent claims 1 and 17 requires optical fibers having tip portions disposed approximately along a straight line extending in a direction generally perpendicular to the optical axis of each of the optical fibers.

Claims 1 and 17 further require first and second optical paths having substantially equal lengths. Thus while the optical switch of Mills and the optical switch recited in each of amended claims 1 and 17 achieve approximately equal length optical paths, amended claims 1 and 17 can achieve this without requiring the optical fibers to be staggered, but rather provides optical fibers which are disposed generally parallel to each other and which have tip portions disposed

approximately along a straight line extending in a direction generally perpendicular to the optical axis of each of the optical fibers. By this construction, the optical switch recited in amended claims 1 and 17 can be fabricated much smaller than the optical switch disclosed by Mills which requires a large space to accommodate the staggered optical fibers.

In the absence of the foregoing disclosure recited in amended independent claims 1 and 17, anticipation cannot be found. See, e.g., W.L. Gore & Associates v. Garlock, Inc., 220 USPQ 303, 313 (Fed. Cir. 1983), cert. denied, 469 U.S. 851 (1984) ("Anticipation requires the disclosure in a single prior art reference of each element of the claim under consideration"); Continental Can Co. USA v. Monsanto Co., 20 USPQ2d 1746, 1748 (Fed. Cir. 1991) ("When more than one reference is required to establish unpatentability of the claimed invention anticipation under § 102 can not be found."); Lindemann Maschinenfabrik GmbH v. American Hoist & Derrick Co., 221 USPQ 481, 485 (Fed. Cir. 1984) (emphasis added) ("Anticipation requires the presence in a single prior art reference disclosure of each and every element of the claimed invention, arranged as in the claim").

Stated otherwise, there must be no difference between the claimed invention and the reference disclosure, as

viewed by a person of ordinary skill in the field of the invention. This standard is clearly not satisfied by Mills for the reasons stated above. Furthermore, Mills does not suggest the claimed subject matter and, therefore, would not have motivated one skilled in the art to modify Mills' optical switch to arrive at the claimed invention.

Claims 2, 3, 13, 15, 16 and 18-20 depend on and contain all of the limitations of amended independent claims 1 and 17, respectively, and, therefore, distinguish from Mills at least in the same manner as claims 1 and 17.

In view of the foregoing, applicants respectfully request that the rejection of claims 1-3, 13 and 15-20 under 35 U.S.C. §102(e) as being anticipated by Mills be withdrawn.

Rejections Under 35 U.S.C. §103(a)

Claims 4 and 6 were rejected under 35 U.S.C. §103(a) as being unpatentable over Mills in view of Hill. Applicants respectfully traverse this rejection and submit that the combined teachings of Mills and Hill do not disclose or suggest the subject matter recited in amended claims 4 and 6.

Mills does not disclose or suggest the subject matter recited in amended independent claim 1 as set forth above for the rejection under 35 U.S.C. §102(e). Claims 4 and 6 depend on and contain all of the limitations of amended independent claim 1 and, therefore, distinguish from the reference at least in the same manner as claim 1.

The secondary reference to Hill has been cited for its disclosure of an optical switch used in an optical communication part of an add-drop system. However, Hill does not disclose or suggest the structural combination of the optical switch recited in amended claim 1, from which claims 4 and 6 depend, including first, second, and third optical fibers disposed generally parallel to each other at non-equal intervals in a direction generally perpendicular to an optical axis of each of the optical fibers, the optical fibers having tip portions disposed approximately along a straight line extending in a direction generally perpendicular to the optical axis of each of the optical fibers. Since Hill does not disclose or suggest these structural features recited in amended independent claim 1, it does not cure the deficiencies of Mills. Accordingly, one ordinarily skilled in the art would not have been led to modify the references to attain the claimed subject matter.

In view of the foregoing, applicants respectfully request that the rejection of claims 4 and 6 under 35 U.S.C. §103(a) as being unpatentable over Mills in view of Hill be withdrawn.

Claim 14 was rejected under 35 U.S.C. §103(a) as being unpatentable over Mills in view of Jing. Applicants respectfully traverse this rejection and submit that the

combined teachings of Mills and Jing do not disclose or suggest the subject matter recited in amended claim 14.

Mills does not disclose or suggest the subject matter recited in amended independent claim 1 as set forth above for the rejection under 35 U.S.C. §102(e). Claim 14 depends on and contains all of the limitations of amended independent claim 1 and, therefore, distinguishes from the reference at least in the same manner as claim 1.

The secondary reference to Jing has been cited for its disclosure of lenses for converging or collimating a beam. However, Jing does not disclose or suggest the structural combination of the optical switch recited in amended claim 1, from which claim 14 depends, including first, second, and third optical fibers disposed generally parallel to each other at non-equal intervals in a direction generally perpendicular to an optical axis of each of the optical fibers, the optical fibers having tip portions disposed approximately along a straight line extending in a direction generally perpendicular to the optical axis of each of the optical fibers. Since Jing does not disclose or suggest these structural features recited in amended independent claim 1, it does not cure the deficiencies of Mills. Accordingly, one ordinarily skilled in the art would not have been led to modify the references to attain the claimed subject matter.

In view of the foregoing, applicants respectfully request that the rejection of claim 14 under 35 U.S.C. §103(a) as being unpatentable over Mills in view of Jing be withdrawn.

The amendments to the specification and claims made herein do not raise new issues requiring further search and/or consideration. Instead, independent claims 1 and 17 have been amended to better define the "straight line" in response to the Examiner's concerns in the last line of paragraph 29 of the December 7, 2004 Office Action, page 20 of the specification has been revised only to provide literal basis for the amendment to claims 1 and 17 in compliance with 37 C.F.R. §1.75(d)(1), claims 1, 3 and 2, 14 have been amended to overcome the objections and indefiniteness rejection, respectively, raised by the Examiner, allowable claims 7 and 8 have been rewritten in independent form as proposed by the Examiner, and the previously submitted abstract has been amended only to more clearly reflect the invention to which the amended claims are directed and to comply with the length requirement specified in 37 C.F.R. §1.72, thereby placing the application in condition for allowance or otherwise materially reducing the issues which remain for appeal.

In view of the foregoing amendments and discussion,
the application is believed to be in allowable form.
Accordingly, entry of this amendment and favorable
reconsideration and allowance of the claims are most
respectfully requested.

Respectfully submitted,

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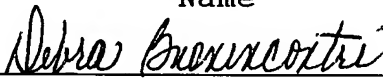
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March 4, 2005

Date